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The Polish Zloty and the Swedish Krona in the Prospects of the ERM II

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Abstract

The economies of Poland and Sweden are quite different, but the Polish and Swedish foreign exchange markets are similar. The main difference between them is the size of turnover, the Swedish market is more than five times larger than the Polish one. The aim of the paper is to identify factors determining the relationship between exchange rates volatility of the Polish zloty, Swedish krona, U.S. dollar and euro in the context of the development of the foreign exchange markets. The strong correlation of the EUR/USD exchange rate with the USD/PLN and USD/SEK exchange rates can be explained by the transactional and currency structures of the Polish and Swedish markets.

Keywords: foreign exchange market, Swedish krona, Polish zloty, ERM II

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Introduction

The economies of Poland and Sweden are quite different. Sweden is a country with mature market economy; Poland has been in the process of transition from a communist to capitalistic economy for 20 years. Basic economic indicators place these countries on opposite sides of the European countries' rankings. Sweden has been a member of the EU since 1995 and a monetary cooperation of that country with the EU began in 1973. Poland has been a member of the EU since 2004 and its monetary cooperation with the monetary authorities of Community is limited to a minimum. For several years Sweden has been meeting the nominal convergence criteria for the euro area, with one exception – participation in the ERM II. Poland has serious problems with reaching the required level of indicators of the Maastricht Treaty and is also not a member of the ERM II.

What therefore led us to compare the Swedish krona and the Polish zloty in the context of accession of those countries to the euro zone? In our opinion there are two common features of the foreign exchange market situation of these countries:

- High level of correlation of fluctuations of SEK and PLN exchange rate to USD exchange rate as compared to EUR exchange rate,
- Similar structures of the Polish and Swedish foreign exchange markets.

The aim of the paper is to identify factors determining the relationship between exchange rates volatility of the Polish zloty, Swedish krona, U.S. dollar and euro in the context of the potential inclusion of PLN and SEK into the ERM II. The paper consists of three parts. In the first part the correlation coefficients of PLN and SEK exchange rates to EUR and USD exchange rates are analyzed. In the second part the Polish foreign exchange market is examined, and in the third – the Swedish one.

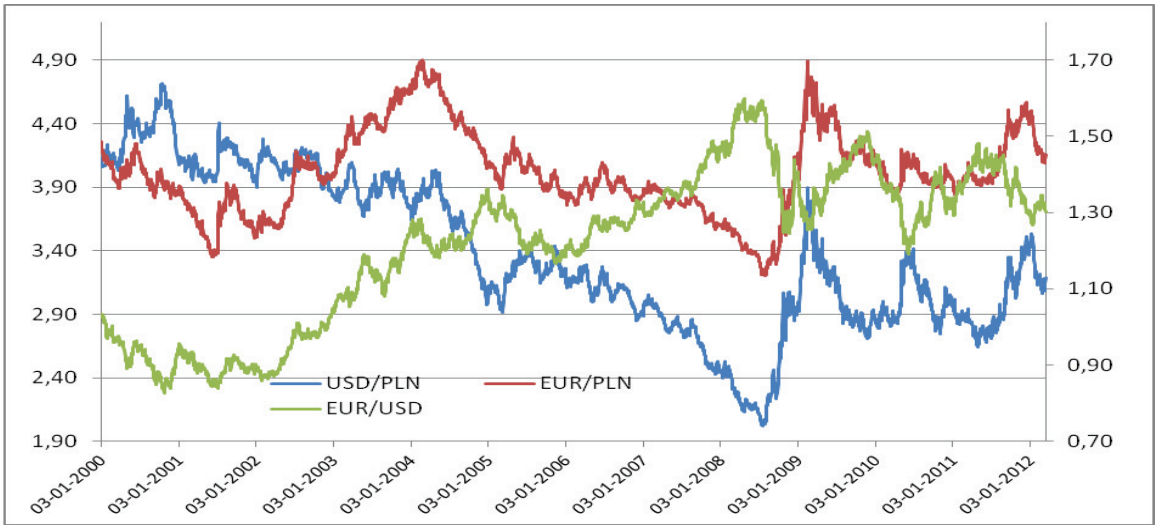
1. The analysis of the correlation among SEK, PLN and EUR/USD exchange rates

As stated in remarks presented in the introduction to this paper we believe that correlation coefficients of USD/SEK, EUR/SEK, USD/PLN, EUR/PLN and EUR/USD are good measures of the real convergence between the currencies. The strong correlation between SEK, PLN and EUR would mean that the Polish zloty and Swedish krona are the shadows of the common European currency and without any significant risks can be introduced into ERM II. For the purpose of the research we have assumed that Poland and Sweden have currently the bi-currency standard of the foreign exchange market what means that both EUR and USD serve as an international currency on their domestic financial markets. That means that the fluctuations of the EUR/USD exchange rate strongly determine changes of the Polish zloty and the Swedish krona exchange rates. From the point of view of statistical analysis the assumption of the bi-currency standard means that EUR/USD exchange rate becomes a benchmark for the examined coefficients of correlation.

Firstly we have examined the Polish foreign exchange market. Three measurements have been used to study the correlations estimated on the basis of Reuters database (the daily closing-bid rates shown in the Graph below): correlation coefficient, Pearson's coefficient and R^2 coefficient. The study comprises the period between January 3, 2000 and March 14, 2012.

A comparison of the coefficients presented in Table 1 shows that the changes of USD/PLN exchange rate were much more correlated with the changes of EUR/USD then EUR/PLN exchange rates. It proves that zloty is stronger determined by fluctuations of U.S. dollar on global foreign exchange markets then by fluctuations of euro.

Graph 1. The fluctuations of the euro-US dollar, the US dollar–zloty and the euro-zloty exchange rates



Source: Reuters.

Table 1. Correlation coefficients for EUR/USD, USD/PLN and EUR/PLN calculated for the daily closing-bid rates

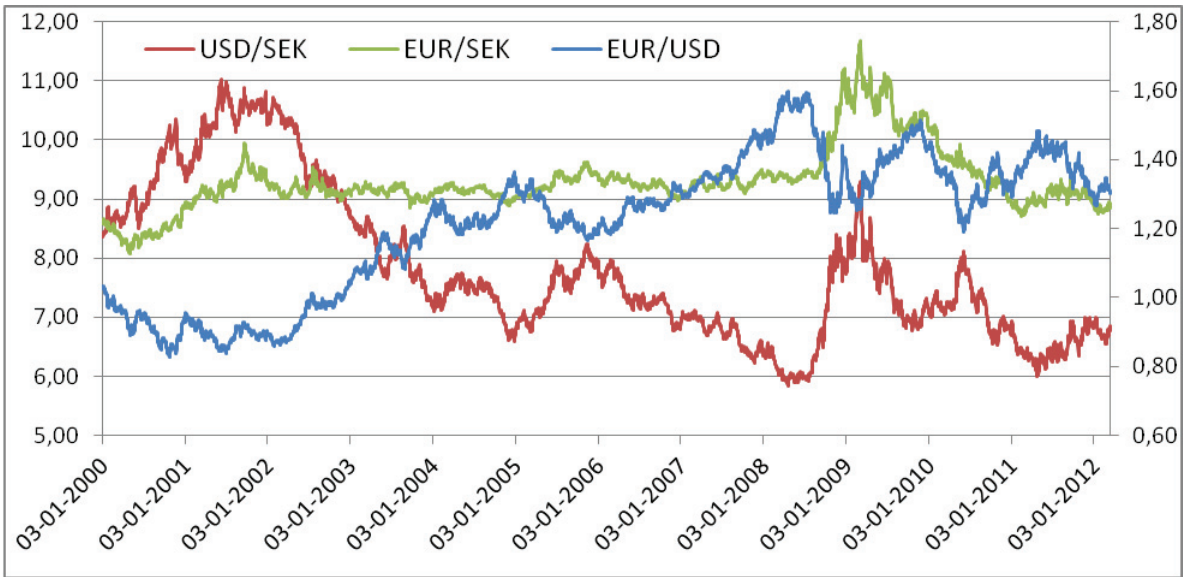
Correlation coefficient:	USD/PLN	EUR/USD	EUR/PLN
USD/PLN	1,00	- 0,93	0,31
EUR/USD	- 0,93	1,00	0,04
EUR/PLN	0,31	0,04	1,00
Pearson coefficient :	USD/PLN	EUR/USD	EUR/PLN
USD/PLN	1,00	- 0,93	0,31
EUR/USD	- 0,93	1,00	0,04
EUR/PLN	0,31	0,04	1,00
R^2 coefficient:	USD/PLN	EUR/USD	EUR/PLN
USD/PLN	1,00	0,87	0,10
EUR/USD	0,87	1,00	0,00
EUR/PLN	0,10	0,00	1,00

Source: Own calculations based on Reuters data.

Afterwards we have examined the Swedish foreign exchange market. The same three measurements have been used to study the correlations estimated on the basis of Reuters database (the daily closing-bid rates shown in the Graph below): correlation coefficient, Pearson's coefficient and R^2 coefficient. The study comprises the period between January 3, 2000 and March 14, 2012.

The results of all the measurements (Table 2) leave no doubt that the fluctuations of SEK, as PLN, have been more correlated with the changes of U.S. dollar then changes of euro exchange rates. It means that both currencies are more determined by USD then by EUR fluctuations.

Graph 2. The fluctuations of EUR/USD, USD/SEK and EUR/SEK exchange rates



Source: Reuters.

Table 2. Correlation coefficients for EUR/USD, USD/SEK and EUR/SEK calculated for the daily closing-bid rates

Correlation coefficient:	EUR/USD	EUR/SEK	USD/SEK
EUR/USD	1,00	0,42	-0,94
EUR/SEK	0,42	1,00	-0,12
USD/SEK	-0,94	-0,12	1,00
Pearson coefficient :	EUR/USD	EUR/SEK	USD/SEK
EUR/USD	1,00	0,17	0,88
EUR/SEK	0,17	1,00	0,01
USD/SEK	0,88	0,01	1,00
R^2 coefficient:	EUR/USD	EUR/SEK	USD/SEK
EUR/USD	1,00	0,17	0,88
EUR/SEK	0,17	1,00	0,01
USD/SEK	0,88	0,01	1,00

Source: Own calculations based on Reuters data.

2. The characteristics of the Polish foreign exchange market

The Polish domestic foreign exchange market is relatively young. In our opinion the volume and structure of the Polish domestic exchange market significantly determines the stability of the zloty and the possibility of the inclusion of the Polish currency in ERM.

This part of paper aims at analyzing the situation on the Polish domestic exchange market in April 2004, April 2007 and April 2010 from the point of view of the market entities, the types of foreign currency

transactions and the structure of foreign currency. The following analysis enables one to appraise the readiness of the exchange market to minimize effects of the zloty exchange rate fluctuations and explain the strong correlation between PLN and USD.

In April 2010, the average daily turnover in the domestic foreign exchange market decreased by 15% at current exchange rates, compared to the value of transactions in April 2007. Contrary to the earlier period when they increased noticeably - in April 2007 the average daily turnover in the domestic foreign exchange market increased by 39% at current exchange rates, compared to the value of transactions in April 2004. All the detailed data are to be found in table 3.

Table 3. Average daily turnover in the Polish foreign exchange market in April 2004, April 2007 and April 2010

	2004 (million USD)	2007 (million USD)	2010 (millionUSD)	2004 (%)	2007 (%)	2010 (%)
Spot transactions	1 930	2 405	1 955	30,4	26,1	24,9
Outright-forwards	329	527	318	5,2	5,7	4,1
FX swaps	4 095	5 881	5 368	64,4	63,8	68,4
Foreign exchange market	6 354	8 813	7 848	100,0	100,0	100,0

Source: The NBP Report on the turnover in the domestic foreign exchange currency market in April 2007, p.2.; The NBP Report on the turnover in the domestic foreign exchange currency market in April 2010, p.3.

In the period between 2004 and 2010 the structure of transactions in the domestic exchange market did not change significantly, foreign exchange/FX swap contracts dominated (Table 3). It can be regarded as a consequence of quickly developing "carry trade" on the Polish interest rates.

In the analyzed period negative tendencies in the specific entities structure of the domestic market became prevailing. The share of transactions with foreign financial entities concluded in April 2004 amounted to 78%, in April 2007 – 78% as well, in April 2010 their share decreased slightly to 73%. The so called "client market" - spot contracts with non-financial entities - represented only 5.7% of the entire transactions in 2007 and 5,8% in 2010, as illustrated by the data in Table 4.

Table 4. Average daily turnover in specific segments of the Polish foreign exchange market in April 2004, in April 2007 and in April 2010 (in million US dollars)

	2004			2007			2010		
	Resident	Non-resident	Total	Resident	Non-resident	Total	Resident	Non-resident	Total
Spot transactions	**614**	**1 306**	**1 930**	**806**	**1 599**	**2 405**	**755**	**1 200**	**1 955**
with financial institutions	314	1 300	1 614	309	1 586	1 895	296	1 197	1 493
with non-financial customers	310	6	316	497	13	510	459	3	462
Outright-forwards	**300**	**29**	**329**	**440**	**87**	**527**	**293**	**25**	**318**
with financial institutions	12	25	37	21	86	107	72	24	96
with non-financial customers	288	4	292	419	1	420	221	1	222
FX swaps	**450**	**3 645**	**4 095**	**665**	**5 216**	**5 881**	**998**	**4 370**	**5 368**
with financial institutions	411	3 645	4 056	584	5 207	5 791	970	4 362	5 332
with non-financial	39	0	39	81	9	90	28	8	36

customers								
Foreign exchange market	**1 364**	**4 980**	**6 354**	**1 911**	**6 902**	**8 813**	**2 110**	**5 738**	**7 848**
with financial institutions	737	4 970	5 707	914	6 879	7 793	1 350	5 726	7 076
with non-financial customers	637	10	647	997	23	1 020	760	12	772

Source: see Table 3

It is evident from the presented data that transactions with the foreign non-resident financial institutions dominated the foreign exchange market. As for the structure of transactions, the FX spot contracts with non-resident financial entities amounted to 5 207 million US dollars in 2007 and to 4 362 in 2010. Typical of the Polish domestic foreign exchange market as compared to the global market was a comparatively large share of foreign entities. Thus, in April 2007, 38% of the transactions in the global market were contracts with local entities, and 62% constituted cross-border transactions. In April 2010 35% - with local entities and 65% - cross-border respectively [BIS 2007 str. 6, BIS 2010 str. 9]. In Poland the respective proportions were as follows: in April 2007: 21% in the domestic market and 79% in the cross-border transactions; in April 2010: 27% in the domestic market and 73% in the cross-border transactions (Table 4).

Table 5. The share of PLN and USD in turnover in the domestic foreign exchange market in April 2004, April 2007 and April 2010

		2004		**2007**		**2010**	
		mln USD	**%**	**mln USD**	**%**	**mln USD**	**%**
spot	USD	673	-	19	-	19	-
	EUR	358		1 274		1 153	
forward	USD	61	-	78	-	69	-
	EUR	117		186		216	
fx swap	USD	3 398	-	4 234	-	3 006	-
	EUR	57		24		858	
total	**USD**	**4 132**	**65**	**4 331**	**47**	**3 094**	**39**
	EUR	**536**	**8**	**1 484**	**16**	**2 227**	**28**

Source: see Table 3

The other currencies were not considered so the transactions do not sum up to total volume and to 100%.

The dominance of the FX swaps with non-residential financial institutions among all segments accounted for the fact that the domestic exchange market gradually assumed the qualities of the extraterritorial market. This caused that zloty rate fluctuations were dependant mainly upon the changes of financial parameters in the global market. For example the change of spread between the benchmark securities in the Polish domestic exchange market and the foreign exchange market (USD, EUR). The situation is not

easy to interpret and may have both positive and negative consequences for the exchange-rate policy of the National Bank of Poland and the market stability.

To include the Polish foreign exchange market in the category of "developed markets" might be an exaggeration. It remained a rather small segment of the global market. The percentage share of the zloty in foreign trade operations accounted for only 0.4% in 2004, 0.8% in 2007, and 0,8 in 2010 of the global trade volume, in total 200%.

The data presented in table 5 clearly demonstrate the changes of the Polish exchange market currency structure that took place between April 2004 and April 2010. In the period under review the EUR/PLN turnover volume grew significantly. One may conclude that this change was probably a consequence of Poland's accession to the European Union in May 2004, when foreign exchange dealers presumed that the EUR/PLN pair would be the main currency pair in the market and began quoting the zloty in relation to the euro. The USD/PLN rate was treated as a resultant rate, dependent on the EUR/PLN and EUR/USD rates. Among other things, the changes derived from an extensive use of the euro as invoice currency and as currency of denomination and settlement in markets.

Despite the increasing role of the euro in the domestic foreign exchange market, the transactions USD/PLN still prevail. In the most liquid and dynamic FX swap market, exchanging dollars for the zloty (and vice versa) dominate, mainly for the purpose of investment in the zloty denominated Treasury bonds.

The dominance of USD in turnover in the Polish foreign exchange market has the consequence for the Polish zloty exchange rate. The strong correlation between PLN and USD exchange rate fluctuations can lead to disturbances in the process of Poland's integration with the euro zone. Using the methodology developed by J. Frankel [Frankel, 1998] the euro-zloty to the euro-US dollar correlation can be defined as a "symmetric" monetary shock, whereas the euro-US dollar as the "asymmetric" monetary shock. Asymmetric shocks initiate adjusting processes in the Polish economy which may disrupt the synchronization of the business cycle of the Polish economy with that of the euro zone. The absorption of asymmetric shocks can be done by two different channels: through changes in the effectiveness of foreign trade as well as through processes used in financial markets, including capital flows. In both cases these processes will not support Poland's integration with the euro zone.

3. The characteristics of the Swedish foreign exchange market

The Swedish foreign exchange market will be described using the same criteria in the same period as were used for the Polish one.

In April 2010 the total volume of the global foreign exchange daily transactions amounted to 3 981 billion USD. The transactions in SEK were about 2,2% of global daily turnover. It means that daily turnover in SEK amounted to ca 88 billion USD. As compared to 2007 (90 billion USD) they decreased by about 2 billions USD. Comparing the global turnover in SEK to the total domestic Swedish foreign exchange market nearly 100% transactions in SEK have been carried out in the domestic market.

In April 2010 the average daily turnover in the domestic foreign exchange market increased slightly by 6% at current exchange rates, compared to the value of transactions in April 2007. In the earlier period when they increased noticeably - in April 2007 the average daily turnover in the domestic foreign exchange market increased by 37% at current exchange rates, compared to the value of transactions in April 2004. All the detailed data are to be found in table 6.

Table 6. Average daily turnover in the domestic foreign exchange market in April 2004, April 2007 and April 2010

	2004 (million USD)	2007 (million USD)	2010 (millionUSD)	2004 (%)	2007 (%)	2010 (%)
Spot transactions	7 147	7 768	11 794	23,2	18,4	26,3
Outright-forwards	1 191	1 561	1 944	3,9	3,7	4,3

FX swaps	22 482	32 821	29 312	72,9	77,9	65,4
Foreign exchange market	**30 820**	**42 150**	**44 796**	**100,0**	**100,0**	**100,0**

Source: BIS 2004, 2007, 2010

In the period between 2004 and 2010 the structure of transactions in the domestic foreign exchange market in Sweden was very similar to the Polish one, foreign exchange FX swap contracts dominated (Table 6). In the period between 2007-2010 their share decreased considerably, by 12 p.p. In the global foreign exchange market the share of the FX swap in the total turnover amounted to 53% in 2007 and ca 50% in 2010. The significant difference between the volume of the FX swap market in Sweden and the volume of the global FX swap market can be seen which is hardly possible to explain by carrying out transactions "carry trade" (like in Poland).

The analysis of the entities structure of the Swedish foreign exchange market shows that the main tendencies are very similar to the Polish ones as well, just like in case of the transactions structure. The share of transactions with foreign financial entities concluded in April 2004 amounted to 61%, in April 2007 – 54%, in April 2010 their share increased to 66%. The "client market" - spot contracts with non-financial entities - represented only 5,7% of the entire transactions in 2007 and 2,8% in 2010 respectively, as illustrated by the data in Table 7.

Table 7. Average daily turnover in specific segments of the Swedish domestic foreign exchange market in April 2004, in April 2007 and in April 2010 (in million US dollars)

	2004			**2007**			**2010**		
	Resident	**Non-resident**	**Total**	**Resident**	**Non-resident**	**Total**	**Resident**	**Non-resident**	**Total**
Spot transactions	**1 890**	**5 256**	**7 147**	**3 257**	**4 511**	**7 768**	**1 993**	**9 801**	**11 794**
with financial institutions	441	4 859	5 300	816	3 699	4 515	1 177	9 357	10 534
with non-financial customers	1 449	397	1 846	2 441	812	3 253	816	444	1260
Outright-forwards	**698**	**494**	**1 191**	**1 226**	**334**	**1 561**	**1 423**	**521**	**1 944**
with financial institutions	205	306	511	371	223	594	433	323	756
with non-financial customers	493	188	681	855	111	966	990	198	1188
FX swaps	**6 418**	**16 065**	**22 482**	**12 374**	**20 447**	**32 821**	**7 842**	**21 470**	**29 312**
with financial institutions	2 040	13 725	15 765	5 617	19 209	24 826	3 682	18 633	22 315
with non-financial customers	4 378	2 340	6 718	6 757	1 238	7 995	4 160	2 837	6 997
Foreign exchange market	**9 006**	**21 815**	**30 820**	**16 857**	**25 292**	**42 150**	**11 727**	**33 068**	**44 796**
with financial institutions	2 686	18 890	21 576	6 804	23 131	29 935	5 452	29 468	34 920
with non-financial customers	6 320	2 925	9 245	10 053	2 161	12 214	6 275	3 600	9 875

Source: BIS 2004, 2007, 2010

Transactions with the foreign non-resident financial institutions dominated in the foreign exchange market in Sweden (Table 7). As far as the structure of transactions is concerned, the FX spot contracts with non-resident financial entities amounted to 19 209 million US dollars in 2007 (46% of total turnover) and to

18 633 in 2010 (42% respectively). The share of transactions concluded by the non-residents has evolved over the years. In 2007 it was just like the global average: 40% - transactions of the domestic entities, 60% - transactions of the foreign ones. The significant change took place in 2010: 26% - transactions of the domestic entities, 74% - cross-border transactions. In 2010 the entities structure of the Swedish foreign exchange market became similar to the Polish structure. It is surprising as the Polish market is a developing one, with the overwhelming dominance of the foreign investors.

Just like in Poland the FX swap transactions dominate in Sweden, but the scale of this dominance is smaller. In our opinion the Swedish foreign exchange market situation is difficult to interpret. In 2004 only 29% transactions were concluded by the domestic entities, this amount increased to 40% in 2007 and next decreased to 26% in 2010. Looking at the data it seems that the year 2007 was untypical as far as the share of domestic entities in concerned. If we assume that this share oscillates around 25-30% we can draw the conclusion that the entities structures of the Swedish and Polish markets are similar. It means further that the fluctuations of the SEK exchange rate may depend on the changes of indicators of the global financial market and this fact could explain the considerable increase of fluctuations of the SEK exchange rate in 2009.

The Swedish foreign exchange market is not a prominent one, but it is not a periphery either. The Swedish krona ranked number nine in terms of volume of global currency trade. The share of SEK transactions amounted to 2,2% in 2004, 2,7% in 2007 and 2,2% in 2010 of the global trade volume (total 200%).

Table 8. The share of EUR and USD in turnover in the Swedish domestic foreign exchange market in April 2007 and April 2010

		2007		**2010**	
		mln USD	**%**	**mln USD**	**%**
spot	USD	1 309	-	1 630	-
	EUR	3 739		3 099	
forward	USD	1 539	-	1 418	-
	EUR	1 626		1 605	
fx swap	USD	15 204	-	7 793	-
	EUR	3 738		3 738	
total	**USD**	**18 052**	**57,4**	**10 841**	**48,5**
	EUR	**9 103**	**29,0**	**8 442**	**37,8**
Total all currencies		**31 460**		**22 345**	

Source: BIS 2007, 2010

The other currencies were not considered so the transactions do not sum up to total volume and to 100%

The data presented in table 8 demonstrate the evolution of the Swedish exchange market currency structure that took place between April 2007 and April 2010. In the period under review the EUR/SEK turnover volume in percent grew significantly (from 29% in 2007 to 37,8% in 2010) like in Poland. It is a consequence of decrease in volume of FX swap transactions concluded in USD and relative increase in volume of transactions concluded in EUR.

Conclusion

The above characteristics of the Polish and Swedish foreign exchange markets has shown many similarities between these two markets. The main difference between them is the size of turnover; Swedish market is more than five times larger than the Polish one. The similarities are as follows:

- almost identical transactional structure of the markets in Poland and Sweden dominated by the FX swap transactions (Table 3 and Table 6).
- dominance of transactions with foreign financial institutions both in Poland and in Sweden (Table 4 and Table 7).
- the currency structure of the Polish and Swedish market characterized by a dominance of the USD transactions, however the growing share of the euro should be noted in recent years.

The structures of transaction and currency of the Polish and Swedish markets explain the reasons for the strong correlation of the EUR/USD exchange rate with the USD/PLN and USD/SEK exchange rates. This is a consequence of the fact that the FX swap transactions in U.S. dollars make up the majority of transactions concluded on the Swedish and Polish foreign exchange markets. One should keep in mind that nowadays short and medium term changes in the exchange rates are determined by the ratio of domestic and foreign prices of financial assets.

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